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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/589,439

08/15/2006

Ren-Hua Jin

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EXAMINER

HARRIS, GARY D

ART UNIT

PAPER NUMBER

1785

MAIL DATE

DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/589,439	Applicant(s) JIN ET AL.	
	Examiner GARY D. HARRIS	Art Unit 1785	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 13 May 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-9 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-9 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1-9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Smith WO 01/27368 in view of Sakai et al. US 5,750,258.

As to Claim 1, Smith discloses an organic-inorganic hybrid nanofiber (See under technical field, Line 9-10). The nanofibers are crystalline polymer filaments made of a polymer having a straight-chain polyethyleneimine skeleton (linear polyethyleneimine) (See abstract and summary of invention).

Smith is silent to silica covering said crystalline polymer filament.

However, Sakai et al. US 5,750,258 discloses a crosslinked resin-coated silica fine particle using a vinyl-silane coupling agent (see abstract). The vinyl-containing silane coupling agent is made of a silane portion (alkoxysilane similar to applicants disclosure) while using polyethyleneimine as a dispersion stabilizer (Col. 13, Line 37-40). The crosslink coated silica is suitable for controlling the thickness of a liquid crystal layer (crystalline polymer) (Col. 1, Line 6-10). Additionally, using silica allows for improved properties including high hardness and strength (Col. 3, 4, Line 66-67, 1-12).

It would have been obvious to one of ordinary skill in the art to modify Smith using silica covering in order to control the thickness of the polymer filament. One would have been motivated to use a silica covering in order to improve the hardness and the strength of the material being coated. One of ordinary skill would recognize that using a silica covering would provide the attributes of a composite (more than one type of material).

As to Claim 2, Smith discloses the polymer is a straight-chain polyethyleneimine skeleton is in the form of a line, a star, or a comb (fibers are rendered insoluble when crosslinked) (Page 4, Line 31-32).

As to Claim 3, Smith discloses the nanofiber straight-chain polyethyleneimine skeleton is composed of a block copolymer (grafter) between a straight-chain polyethyleneimine block and other blocks. (Bis-epoxide is used as a crosslinking agent and becomes a resident of the fiber upon curing, see Page 7, Line 24-30)

As to Claim 4, Smith discloses the organic-inorganic hybrid nanofiber proportion of the polyethyleneimine skeleton in said polymer having the straight-chain polyethyleneimine skeleton is typically 1 to about 25 percent by weight mixed with bis-epoxide in ethanol and then electorspun into the desired fibers. The bis-epoxide is a crosslinking agent and becomes a resident within the fiber upon curing (Page 7, Line 24-30). The fibers produced have secondary amine sites and are compatible with textile fabrics (Page 7, Line 31-36). These nanofibers can be used as blended coverings. When only a few percent by weight of the nanofibers are used most of the surface area of a fabric will still have nanofibers (Page 7, Line 31-36).

Smith is silent with regard to the polyethyleneimine skeleton is not less than 25% by mol.

However, Smith discloses the polyethyleneimine skeleton in said polymer having the straight-chain polyethyleneimine skeleton is typically 1 to about 25 percent by weight mixed with bis-epoxide in ethanol and then electorspun into the desired fibers. The bis-epoxide is a crosslinking agent and becomes a resident within the fiber upon curing (Page 7, Line 24-30). The fibers produced have secondary amine sites and are compatible with textile fabrics (Page 7, Line 31-36). These nanofibers can be used as blended coverings. When only a few percent by weight of the nanofibers are used most of the surface area of a fabric will still have nanofibers (Page 7, Line 31-36).

It would have been obvious to one skilled in the art to change the mol percentage of the polyethylene skeleton in order to allow a cross linking agent to become a resident of the fibers. One would have been motivated to change the mol percentage to allow the polymer to allow for a degree of curing. One of ordinary skill would have recognized that changing the mol percentage would allow for the nanofibers to be easily blended. Additionally, one skilled in the art would change the mol percentage as this would be a result effective variable. As the mol percentage increases the number of crosslinking cites on the molecule will increase. See MPEP 2144.05 [R-5].

As to Claim 5, Smith is silent in regards to the organic-inorganic hybrid nanofiber wherein an amount of the silica included is in a range of from 30 to 90% by weight.

As to Claim 6, Smith discloses the organic-inorganic hybrid nanofiber has a diameter thereof is in a range of from 100 to 1,000 nm (1 micron) (Page 1, Line 8).

As to Claim 7, Smith discloses the organic-inorganic hybrid nanofiber has a diameter of said crystalline polymer filament (polymer itself) in a range of from 100 nm to 1 micron, overlapping applicants range (Page 7, Line 1-2).

As to Claim 8, Smith is silent in regards to the organic-inorganic hybrid structure formed by mutually aggregating (mixture of minerals separated) the organic-inorganic hybrid nanofibers of the crystalline polymer filaments themselves in said organic-inorganic hybrid nanofiber.

However, Sakai et al. US 5,750,258 discloses a crosslinked resin-coated silica fine particle (aggregate) using a vinyl-silane coupling agent (see abstract). The vinyl-containing silane coupling agent is made of a silane portion (alkoxysilane similar to

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applicants disclosure) while using polyethyleneimine as a dispersion stabilizer (Col. 13, Line 37-40). The crosslink coated silica is suitable for controlling the thickness of a liquid crystal layer (crystalline polymer)(Col. 1, Line 6-10). Additionally, using silica allows for improved properties including high hardness and strength (Col. 3, 4, Line 66-67, 1-12).

It would have been obvious to one of ordinary skill in the art to modify Smith using silica covering in order to control the thickness of the polymer filament and produce an aggregate structure. One would have been motivated to use a silica covering in order to improve the hardness and the strength of the material being coated and produce an aggregate. One of ordinary skill would recognize that using a silica covering would provide the attributes of a composite (more than one type of material).

As to Claim 9, Smith discloses the organic-inorganic hybrid structure crystalline polymer filaments themselves are crosslinked by means of a crosslinker (bis-epoxide) (Page, Line 17-20).

Response to Arguments

Applicant's arguments (in italics) filed 05/13/2010 with respect to claims 1-9 are addressed as follows:

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Applicant's argument regarding 35 USC 112 second paragraph rejection of the term aggregation and aggregating is persuasive and the 112 rejection is withdrawn.

Claims 1-9 are rejected under 35 U.S.C. §103(a) as being unpatentable over Smith WO 01/27368 and further in view of Sakai et al. (US 5,750,258). (Office action page 3)

The rejection of claims 1-9 is respectfully traversed and reconsideration is requested. With regard to claim 1, the Examiner cites Smith for disclosing an organic-inorganic hybrid nanofiber, where the nanofibers are crystalline polymer filaments made of a polymer having a straight chain polyethyleneimine skeleton. The Examiner states that Smith does not disclose silica covering the crystalline polymer filament. The Examiner cites Sakai et al. for disclosing a crosslinked resin-coated silica fine particle using a vinyl silane coupling agent, where the coupling agent is made of a silane portion while using polyethyleneimine as a dispersion stabilizer. The Examiner states that it would have been obvious to modify Smith using a silica covering in order to control the thickness of the polymer filament, in order to improve the hardness and strength of the material being coated.

In traversing the rejection, Applicant notes that Smith discloses fibers that can react chemically with chemical warfare agents, and are suitable for making a fabric for protection against these chemical agents. Smith discloses fibers ranging from 100 nm to 1 micron in diameter, produced by electrospinning techniques from alcohol solution, and which are generally linear poly(ethyleneimine)s. The rejection is based on "modifying Smith using silica covering ... "(Office action, page 4, lines 1-2). However, the Examiner does not clearly state exactly how Smith would be modified. Applicant submits that Smith discloses electrospinning fibers into a mat or membrane and crosslinking, to provide a fabric (see, for example, page 1, last full paragraph). The only opportunity for coating Smith's fibers would be after the spinning process. However, any attempt to coat Smith's fibers or fabric with a silica coating would clearly render Smith's fabric unsatisfactory for its intended purpose.

Applicant argues that modifying the Smith polyethyleneimine with silica after electrospinning would render the fabric unsatisfactory for the intended purpose. This argument is not persuasive as Smith discloses that the fibers can be used with other materials (bottom of page 7 and top of page 8) as long as the nanofibers are not completely covered the fibers remain effective. Further, the reference teaches the use of the fibers as materials for clothing and the like. Modifying the polyethyleneimine taught in Smith with silica would not render the fabric unsatisfactory for this purpose.

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First of all, Smith's invention relies on the fibers having numerous secondary amine sites available for nucleophilic decomposition of the chemical warfare agents, and a coating of silica would almost certainly block access of the agent to the fibers. That is, if coated with silica, Smith's fibers could no longer decompose the chemical warfare agents.

Applicant argues that the fibers would no longer decompose the chemical warfare agents. However, Smith discloses that the fabrics can be used with other materials allowing them to be breathable to air and water (see pages 7 & 8). The reference teaches the use of the fibers as materials for clothing and the like. Modifying the polyethyleneimine taught in Smith with silica would not render the fabric unsatisfactory for this purpose.

Secondly, Smith's invention is intended to be a fabric worn by a person, and must be "lightweight, breathable fabric, compatible with existing fabrics and permeable to both air and water vapor ..." A fabric coated with silica would almost certainly not have these characteristics.

Applicant argues that Smith with a silica coating would not have these characteristics. However, Smith discloses that the fabric can be used with other materials. Sakai discloses the use of crosslinked silica (vinyl-silane) similar to applicant and the use of polyethyleneimine as a dispersion stabilizer. Clearly Sakai is well aware that polyethyleneimine and vinyl-silane can be used with one another and Smith discloses the fabric can be used with other materials. Sakai uses the silica covering to improve the strength of a material. One skilled in the art would recognize that an increase in material properties would be advantageous in the nanofiber fabric of Smith.

Therefore, any attempt to coat Smith's fabric with silica would lead to a product that would not function for Smith's purpose. Applicant notes that MPEP 2143.01(V) states:

If proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, then there is no suggestion or motivation to

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make the proposed modification. *In re Gordon*, 733 F.2d 900, 221 USPQ 1125 (Fed. Cir. 1984)

Therefore, on the basis of *In re Gordon*, there can be no motivation for such a modification of Smith.

Moreover, Sakai et al. generally discloses crosslinked resin-coated silica fine particles (see title, abstract, column 1, line 6, etc.). The Examiner cites the use of a vinyl-containing silane coupling agent with a polyethyleneimine dispersant. However, the vinyl-containing silane coupling agent in Sakai et al. is used to coat a resin onto silica fine particles. See column 5, lines 27 and ff.:

Applicant argues that the Sakai silica fine particles are coated with a polyethyleneimine dispersant. Applicant notes that the silica and the polyethyleneimine are known to be used with one another. Modifying the Smith invention with the Sakai invention would have been obvious to one skilled in the art to produce a silica covering and to control the thickness of the polymer filament. One would have been motivated to use a silica covering in order to improve the hardness and the strength of the material being coated. One of ordinary skill would recognize that using a silica covering would provide the attributes of a composite (more than one type of material).

"In the crosslinked resin-coated silica fine particles of the present invention, the crosslinked resin coating constitutes an outermost layer formed on each calcined silica fine particle through the vinyl-containing silane coupling agent." (emphasis added)

Specifically, Sakai describes "surface-treating calcined fine particles with a vinyl-containing silane coupling agent to introduce vinyl groups onto a surface of each silica fine particle" (column 4, lines 26-29). The surface-treated silica fine particles are then mixed with monomers having a vinyl group to polymerize them (see column 4, lines 30-37). That is, in Sakai, the silica is used as a core and the polymer layer is the outer layer formed on the core.

Therefore, the vinyl-containing silane coupling agent is not used to form a silica coating in Sakai et al. The reference starts with the silica fine particles, and then coats them with resin. There is no suggestion in Sakai to coat any polymer with silica. It is not even possible to combine Sakai with Smith in the manner proposed by the Examiner.

The Examiner cites the use of polyethyleneimine as a dispersion stabilizer in Sakai. However, no polyethyleneimine is included in the Sakai's resin-coated silica fine particles.

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Therefore, there is no suggestion or motivation in Sakai for the structure recited in the present claims.

Applicant's argument that there is no suggestion to coat a polymer with silica in the Sakai invention is persuasive. However, Sakai is used to show that the silica and the polyethyleneimine are known to be used with one another. Smith discloses the fiber and that the fiber may be used with other materials to allow them to become breathable to air and water vapor. Modifying Smith with the silica in Sakai would allow for improved strength of the fabric and also allow the material to become breathable to air and water vapor.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to GARY D. HARRIS whose telephone number is (571)272-6508. The examiner can normally be reached on 8AM - 5PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Ruthkosky can be reached on 571-272-1291. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Mark Ruthkosky/
Supervisory Patent Examiner, Art Unit 1785

/G. D. H./Gary Harris
Examiner, Art Unit 1785